

Claims

1. Method for operating a nitrogen oxide storage-type catalytic converter of an internal combustion engine, particularly of a motor vehicle,

in which the nitrogen oxides produced by the internal combustion engine are stored in the nitrogen oxide storage catalytic converter in the first operating phase (lean phase) as a storage phase for a specific storage time, and

in which, after expiration of the storage time at a specific switching instant for a specific discharge time, switching to the second operating phase as the discharge phase takes place, in which the nitrogen oxides which were stored during the storage time are discharged from the nitrogen oxide storage catalytic converter,

the switching instant in the storage phase being determined as a function of the nitrogen oxide slip as the difference between the nitrogen oxide mass flow which has flowed into the nitrogen oxide storage catalytic converter and the nitrogen oxide mass flow which has flowed out of the nitrogen oxide storage catalytic converter, each relative to the storage time,

characterized in that

to establish the switching instant from the storage phase to the discharge phase a relative nitrogen oxide slip is determined such that

the nitrogen oxide mass flow upstream of the nitrogen oxide storage catalytic converter and the nitrogen oxide mass flow downstream of the nitrogen oxide storage catalytic converter

are each integrated over the time interval of the lean phase and the quotient of the integral values are brought into a relative relationship with a predeterminable degree of conversion of the nitrogen oxide which has been derived from the exhaust gas limit value, such that when this predetermined switching condition is present, switching from the storage phase to the discharge phase is carried out at the switching instant which has been optimized with respect to fuel consumption and storage potential.

2. The process as claimed in claim 1, wherein

the relative slip is the quotient of the integral over the nitrogen oxide mass flow downstream of the nitrogen oxide catalytic converter and the integral over the nitrogen oxide mass flow upstream of the nitrogen oxide storage catalytic converter, and

wherein this quotient for determining the switching condition is set equal to a predeterminable switching threshold value K which originates from the predeterminable degree of conversion of nitrogen oxide, so that when this switching condition is satisfied, switching from the storage phase at the end of the storage time which has been determined in this way to the discharge phase takes place.

3. The process as claimed in claim 2, wherein the switching threshold value K satisfies the following equation:

$$K = 1 - \text{predetermined conversion rate of nitrogen oxide}$$

with a predetermined conversion rate of nitrogen oxide of less than 1, preferably with a predetermined conversion rate of nitrogen oxide of at least 0.80, at most preferably 0.95.

4. The process as claimed in one of claims 1 to 3, wherein the nitrogen oxide mass flow is modeled upstream of the nitrogen oxide storage catalytic converter.
5. The process as claimed in one of claims 1 to 4, wherein the nitrogen oxide mass flow is measured downstream of the nitrogen oxide storage catalytic converter by means of a nitrogen oxide sensor.
6. The process as claimed in claim 5, wherein a nitrogen oxide mass flow signal which has been measured by means of the nitrogen oxide sensor downstream of the nitrogen oxide storage catalytic converter is supplied to a control device in which the nitrogen oxide mass flow which has been measured downstream of the nitrogen oxide storage catalytic converter is integrated over time, and the integral value which has been determined in this way together with the integral value of the nitrogen oxide mass flow upstream of the nitrogen oxide storage catalytic converter is brought into a relation with the predeterminable degree of conversion of the nitrogen oxide to determine the switching instant, when the switching condition is present the control device delivering a control signal for switching of the nitrogen oxide storage catalytic converter from the storage phase to the discharge phase.
7. Control device especially for use in a process as claimed in one of claims 1 to 6, which controls the storage of the nitrogen oxides produced by the internal combustion engine in a first operating phase (lean phase) as the storage phase for a specific storage time in the nitrogen oxide storage catalytic converter, and

which, after expiration of the storage time at a specific switching instant for a specific discharge time, switches the nitrogen oxide storage catalytic converter to the second operating phase as the discharge phase to discharge the nitrogen oxides which were stored during the storage time from the nitrogen oxide storage catalytic converter, the control

device determining the switching instant in the storage phase as a function of the nitrogen oxide slip as the difference between the nitrogen oxide mass flow which has flowed into the nitrogen oxide storage catalytic converter and the nitrogen oxide mass flow which has flowed out of the nitrogen oxide storage catalytic converter, each relative to the storage time,

wherein

a nitrogen oxide mass flow signal which has been measured by means of a sensor, preferably a nitrogen oxide sensor downstream of the nitrogen oxide storage catalytic converter can be supplied to the control device to integrate the nitrogen oxide mass flow which has been measured downstream of the nitrogen oxide storage catalytic converter over time, and,

wherein the quotient of the integral values of the nitrogen oxide mass flow upstream and downstream of the nitrogen oxide storage catalytic converter can be brought by the control device into a relative relation with the predeterminable degree of conversion of the nitrogen oxide which is derived from the exhaust gas limit value to determine the switching instant which is optimized with respect to fuel consumption and storage potential, when this predetermined switching condition is present the control device delivering a control signal for switching of the nitrogen oxide storage catalytic converter from the storage phase to the discharge phase.